

## SECTION 084413 GLAZED ALUMINUM CURTAIN WALLS

This suggested guide specification has been developed using the current edition of the Construction Specifications Institute (CSI) "Manual of Practice," including the recommendations for the CSI 3 Part Section Format and the CSI Page Format. Additionally, the development concept and organizational arrangement of the American Institute of Architects (AIA) MASTERSPEC Program has been recognized in the preparation of this guide specification. Neither CSI nor AIA endorse specific manufacturers and products. The preparation of the guide specification assumes the use of standard contract documents and forms, including the "Conditions of the Contract," published by the AIA.

### PART 1 - GENERAL

#### 1.1 Related Documents

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 Summary

- A. Section Includes: Kawneer Architectural Aluminum Curtain Wall Systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of curtain wall framing.
  - 1. Types of Kawneer Aluminum Curtain Wall include:
    - a. 2250 L•R (low-rise) Wall System – 2-1/4" x 5" (57.2 x 127) or 2-1/4" x 7-1/4" (57.2 x 190.5) nominal dimension for 1" (25.4) infill; outside glaze, thermal, pressure plate system.
    - b. 2250 L•R (low-rise) Wall System – 2-1/4" x 4-1/4" (57.2 x 108) or 2-1/4" x 6-1/2" (57.2 x 165.1) nominal dimension for 1/4" (6.4) infill; outside glaze, thermal, pressure plate system.

*EDITOR NOTE: BELOW RELATED SECTIONS ARE SPECIFIED ELSEWHERE HOWEVER KAWNEER RECOMMENDS SINGLE SOURCE RESPONSIBILITY FOR ALL OF THESE SECTIONS AS INDICATED IN PART 1.6 QUALITY ASSURANCE.*

#### B. Related Sections:

- 1. 072700 "Air Barriers"
- 2. 079200 "Joint Sealants"
- 3. 083213 "Sliding Aluminum-Framed Glass Doors"
- 4. 084113 "Aluminum-Framed Entrances and Storefronts"
- 5. 084313 "Aluminum-Framed Storefronts"
- 6. 084329 "Sliding Storefronts"
- 7. 084433 "Sloped Glazing Assemblies"
- 8. 085113 "Aluminum Windows"
- 9. 086300 "Metal-Framed Skylights"
- 10. 088000 "Glazing"
- 11. 122600 "Interior Daylighting Devices"

#### 1.3 Definitions

- A. Definitions: For fenestration industry standard terminology and definitions refer to American Architectural Manufacturers Association (AAMA) – AAMA Glossary (AAMA AG).

#### 1.4 Performance Requirements

*EDITOR NOTE: AIR AND WATER PERFORMANCE RESULTS ARE BASED UPON ASTM AND AAMA STANDARDS. CONSULT YOUR LOCAL KAWNEER REPRESENTATIVE CONCERNING SPECIFIC PROJECT PERFORMANCE REQUIREMENTS.*

- A. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
  - 1. Glazed aluminum curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads. Failure also includes the following:
    - a. Thermal stresses transferring to building structure.
    - b. Glass breakage.
    - c. Loosening or weakening of fasteners, attachments, and other components.
    - d. Failure of operating units.
- B. Delegated Design: Design glazed aluminum curtain walls, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

*EDITOR NOTE: PROVIDE WIND LOAD DESIGN PRESSURES IN PSF AND INCLUDE APPLICABLE BUILDING CODE AND YEAR EDITION.*

- C. Wind loads: Provide Curtain Wall system; include anchorage, capable of withstanding wind load design pressures of (\_\_\_\_) lbs./sq. ft. inward and (\_\_\_\_) lbs./sq. ft. outward. The design pressures are based on the (\_\_\_\_) Building Code; (\_\_\_\_) Edition.
- D. Air Infiltration: The test specimen shall be tested in accordance with ASTM E 283. Air infiltration rate shall not exceed 0.06 cfm/ft<sup>2</sup> (0.3 l/s · m<sup>2</sup>) at a static air pressure differential of 6.24 psf (300 Pa).
- E. Water Resistance, (Static): The test specimen shall be tested in accordance with ASTM E 331. There shall be no leakage at a minimum static air pressure differential of 10 psf (479 Pa) as defined in AAMA 501.
- F. Water Resistance, (dynamic): The test specimen shall be tested in accordance with AAMA 501.1. There shall be no leakage at an air pressure differential of 10 psf (479 Pa) as defined in AAMA 501.
- G. Uniform Load: A static air design load of 30 psf (1437 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.

**EDITOR NOTE: THERMAL TRANSMITTANCE AND CONDENSATION RESISTANCE TEST RESULTS IN ACCORDANCE WITH AAMA1503 OR CSA A440 ARE BASED UPON 1" (25.4) CLEAR INSULATING GLASS. (1/4", 1/2" AS 1/4"). REFER TO THERMAL CHARTS IN ACCORDANCE WITH AAMA 507 FOR PROJECT SPECIFIC U-FACTORS, SHGC AND VT. REFER TO THERMAL PERFORMANCE MATRIX FOR NFRC VALUES.**

- H. Thermal Transmittance (U-factor): The (U-factor) shall not be more than:
  1. Captured – 0.60 (clear) per AAMA 1503 or Project Specific (\_\_\_\_) BTU/hr/ft<sup>2</sup>/°F per AAMA 507 or (\_\_\_\_) BTU/hr/ft<sup>2</sup>/°F per NFRC 100.
  2. SSG – 0.55 (clear) or Project Specific (\_\_\_\_) BTU/hr/ft<sup>2</sup>/°F per AAMA 507 or (\_\_\_\_) BTU/hr/ft<sup>2</sup>/°F per NFRC 100.
- I. Condensation Resistance (CRF): When tested to AAMA 1503, the CRF shall not be less than:
  1. Captured – 74<sub>frame</sub> and 60<sub>glass</sub> (clear).
  2. SSG – 75<sub>frame</sub> and 60<sub>glass</sub> (clear).
 or  
 Condensation Index (I): When tested in accordance with CSA-A440-00, the Condensation Index shall not be less than:
  1. Captured – 67<sub>frame</sub> and 54<sub>glass</sub> (clear).
  2. SSG – 70<sub>frame</sub> and 56<sub>glass</sub> (clear).

### 1.5 Submittals

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified preconstruction testing agency, for glazed aluminum curtain walls, indicating compliance with performance requirements.
- F. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed curtain wall systems, made from 12" (304.8) lengths of full-size components and showing details of the following:
  1. Joinery
  2. Glazing

### 1.6 Quality Assurance

- A. Installer Qualifications: Installer who has had successful experience with installation of the same or similar systems required for the project and other projects of similar size and scope.
- B. Manufacturer Qualifications: A manufacturer capable of fabricating glazed aluminum curtain walls that meet or exceed performance requirements.
- C. Source Limitations: Obtain aluminum curtain wall system through one source from a single manufacturer.
- D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
  1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  1. Build mockups for type(s) of curtain wall elevation(s) indicated, in location(s) shown on Drawings.
- F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination".

### 1.7 Project Conditions

- A. Field Measurements: Verify actual locations of structural supports for glazed aluminum curtain walls by field measurements before fabrication and indicate measurements on Shop Drawings.

### 1.8 Warranty

- A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty.
  - 1. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by manufacturer.

## PART 2 - PRODUCTS

*EDITOR NOTE: RETAIN BELOW ARTICLE FOR PROPRIETARY METHOD SPECIFICATION; ADD PRODUCT ATTRIBUTES, PERFORMANCE CHARACTERISTICS, MATERIAL STANDARDS, AND DESCRIPTIONS AS APPLICABLE. DO NOT USE THE PHRASE "OR EQUAL" / "OR APPROVED EQUAL," OR SIMILAR PHRASES. USE OF SUCH PHRASES CAUSES AMBIGUITY IN THE SPECIFICATIONS BECAUSE OF THE DIFFERENT INTERPRETATIONS AMONG THE DIVERGENT PARTIES OF THE CONSTRUCTION PROCESS AND READERS OF THE SPECIFICATIONS. SUCH PHRASES REQUIRE EXTENSIVE AND COMPLETE REQUIREMENTS (PROCEDURAL, LEGAL, REGULATORY, AND RESPONSIBILITY) FOR DETERMINING "OR EQUAL."*

### 2.1 Manufacturers

- A. Basis-of-Design Product:
  - 1. Kawneer Company Inc.
  - 2. 2250 L•R (low-rise) Wall System.
  - 3. Frame depth options:
    - a. 2-1/4" x 5" (57.2 x 127) or 2-1/4" x 7-1/4" (57.2 x 190.5) nominal dimension for 1" (25.4) infill.
    - b. 2-1/4" x 4-1/4" (57.2 x 108) or 2-1/4" x 6-1/2" (57.2 x 165.1) nominal dimension for 1/4" (6.4) infill.
  - 4. Tested to AAMA 501.

*EDITOR NOTE: RETAIN BELOW FOR ALTERNATE MANUFACTURERS/PRODUCTS AS SPECIFIED IN THE CONTRACT DOCUMENTS. COORDINATE BELOW WITH BID DOCUMENTS (IF ANY), AND DIVISION 1 ALTERNATES SECTION. CONSULT WITH KAWNEER COMPANY FOR RECOMMENDATIONS ON ALTERNATE MANUFACTURERS AND PRODUCTS MEETING THE DESIGN CRITERIA AND PROJECT REQUIREMENTS. KAWNEER RECOMMENDS OTHER MANUFACTURERS REQUESTING APPROVAL TO BID THEIR PRODUCT AS AN EQUAL MUST SUBMIT THEIR REQUEST IN WRITING (10) DAYS PRIOR TO CLOSE OF BIDDING.*

- B. Subject to compliance with requirements, provide a comparable product by the following:
  - 1. Manufacturer: (\_\_\_\_\_)
  - 2. Series: (\_\_\_\_\_)
  - 3. Profile dimension: (\_\_\_\_\_)
- C. Substitutions: Refer to Substitutions Section for procedures and submission requirements.
  - 1. Pre-Contract (Bidding Period) Substitutions: Submit written requests ten (10) days prior to bid date.
  - 2. Post-Contract (Construction Period) Substitutions: Submit written request in order to avoid curtain wall installation and construction delays.
  - 3. Product Literature and Drawings: Submit product literature and drawings modified to suit specific project requirements and job conditions.
  - 4. Certificates: Submit certificate(s) certifying substitute manufacturer (1) attesting to adherence to specification requirements for curtain wall system performance criteria, and (2) has been engaged in the design, manufacturer and fabrication of aluminum curtain walls for a period of not less than ten (10) years. (Company Name).
  - 5. Test Reports: Submit test reports verifying compliance with each test requirement required by the project.
  - 6. Samples: Provide samples of typical product sections and finish samples in manufacturer's standard sizes.
- D. Substitution Acceptance: Acceptance will be in written form, either as an addendum or modification, and documented by a formal change order signed by the Owner and Contractor.

### 2.2 Materials

- A. Aluminum Extrusions: Alloy and temper recommended by glazed aluminum curtain wall manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070" (1.8) wall thickness at any location for the main frame and complying with ASTM B 221: 6063-T6 alloy and temper.
- B. Aluminum sheet alloy: Shall meet the requirements of ASTM B209.
- C. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim hardware, anchors, and other components.
- D. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.
- E. Pressure Plate: Pressure plate shall be aluminum and fastened to the mullion with stainless steel screws.
- F. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

Laws and building and safety codes governing the design and use of glazed entrance, window, and curtain wall products vary widely. Kawneer does not control the selection of product configurations, operating hardware, or glazing materials, and assumes no responsibility therefor.

Laws and building and safety codes governing the design and use of glazed necessary for product improvement.  
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- G. Sealant: For sealants required within fabricated curtain wall system, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.
- H. Thermal Barrier: A minimum 1/4" (6.4) separation between the interior and exterior aluminum created by intermittent polymer clips.
- I. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of glazed curtain wall members are nominal and in compliance with AA Aluminum Standards and Data.

### 2.3 Curtain Wall Framing

- A. Framing Members: Manufacturer's standard extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
  - 1. Glazing System: 4 sided captured.
  - 2. Glazing Plane: Front.
- B. Glass: 1" (25.4 insulating glass option. 1/4" (6.4) for Spandrel applications.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- D. Framing Sealants: Shall be suitable for glazed aluminum curtain wall as recommended by sealant manufacturer.
- E. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Where exposed shall be stainless steel.
- F. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.
- G. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- H. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle curtain wall material and components to avoid damage. Protect curtain wall material against damage from elements, construction activities, and other hazards before, during and after installation.

### 2.4 Glazing

- A. Glazing: Comply with Division 08 Section "Glazing". Following glazing options are available.
  - 1. System: Outside glazed pressure plate format with 1" double glazed insulating glass.
- B. Glazing Gaskets: Gaskets to meet the requirements of ASTM C864.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.
- D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.
- E. Glazing Sealants: As recommended by manufacturer for joint type.

### 2.5 Operable Units

- A. Doors: Comply with Division 08 Section "Aluminum-Framed Entrances and Storefronts".
- B. Windows: Comply with Division 08 Section "Aluminum Windows".

### 2.6 Accessory Materials

- A. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762 mm) thickness per coat.
- B. InLighten™ Light Shelf: aluminum light shelf system consisting of anchor channels, support beams, fascia trims and Aluminum Composite Material (ACM) panels that is anchored directly to the Curtain Wall intermediate horizontal members.
  - 1. Light Shelf: Interior mounted shelf to reflect daylight deeper into interior space.
  - 2. Light Shelf System to consist of:
    - a. Aluminum Composite Material (ACM) panel, 4mm thick.
    - b. Translucent polycarbonate panel, 4mm/16mm thick.
    - c. ACM finish on upper and lower surface shall be selected from Kawneer standard finishes.
    - d. Extruded Aluminum outriggers and fascia.
    - e. Extruded aluminum anchor designed to secure to compatible verticals of framing system. Anchor shall be designed to engage shelf so as to allow the shelf to rotate down and hang on its own safely for cleaning.
    - f. Extruded aluminum shear blocks designed to hinge on the anchors to allow rotating individual shelves for cleaning.
    - g. Panel /Shelf projection shall not exceed 30" (762mm).
    - h. Mullion spacing of framing system shall not exceed 6' (1.83 m) on center.
    - i. Panel /Shelf deflection shall not exceed L/120 of horizontal span length.
  - 3. Framing System to Support Light Shelf shall be: (select appropriate framing system)
    - a. Curtain wall framing system.
    - b. Storefront Framing System.
  - 4. Submittals.

- a. Manufacturer's Installation Instructions.
  - b. Samples for Verification.
    - 1) Factory applied finish as selected by architect.
    - 2) Functioning Light Shelf sample demonstrating operation.
  - c. Shop Drawing including:
    - 1) Plans, elevations, sections, fabrication and installation details.
- C. Validation from manufacture of single-source for light shelf and framing system and compatibility between the system.

## 2.7 Fabrication

- A. Form or extrude aluminum shapes before finishing.
- B. Fabricate components that, when assembled, have the following characteristics:
  - 1. Profiles that are sharp, straight, and free of defects or deformations.
  - 2. Accurately fitted joints.
  - 3. Physical and thermal isolation of glazing from framing members.
  - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
  - 5. Provisions for field replacement of glazing from exterior.
  - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
  - 7. Internal weeping system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
- C. Curtain Wall Framing: Fabricate components for assembly using shear block system following manufacturer's standard installation instructions.
- D. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

## 2.8 Aluminum Finishes

*EDITOR NOTE: SELECT BELOW FINISH AND COLOR FROM KAWNEER'S STANDARD COLORS. CUSTOM COLORS ARE AVAILABLE UPON REQUEST FROM THE KAWNEER COMPANY. OTHER PIGMENTED ORGANIC COATINGS CONFORMING TO AAMA 2603 ARE AVAILABLE. CONSULT WITH YOUR KAWNEER REPRESENTATIVE FOR OTHER SURFACE TREATMENTS AND FINISHES.*

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Factory Finishing:
  - 1. Kawneer Permanodic™ AA-M10C21A44 / AA-M45C22A44, AAMA 611, Architectural Class I Color Anodic Coating (Color \_\_\_\_\_).
  - 2. Kawneer Permanodic™ AA-M10C21A41 / AA-M45C22A41, AAMA 611, Architectural Class I Clear Anodic Coating (Color #14 Clear) (Optional).
  - 3. Kawneer Permanodic™ AA-M10C21A31, AAMA 611, Architectural Class II Clear Anodic Coating (Color #17 Clear) (Standard).
  - 4. Kawneer Permafluor™ (70% PVDF), AAMA 2605, Fluoropolymer Coating (Color \_\_\_\_\_).
  - 5. Kawneer Permادize™ (50% PVDF), AAMA 2604, Fluoropolymer Coating (Color \_\_\_\_\_).
  - 6. Kawneer Permادcoat™ AAMA 2604, Powder Coating (Color \_\_\_\_\_).
  - 7. Other: Manufacturer \_\_\_\_\_ Type \_\_\_\_\_ (Color \_\_\_\_\_).

## PART 3 - EXECUTION

### 3.1 Examination

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

*EDITOR NOTE: COORDINATE BELOW ARTICLE WITH MANUFACTURER'S RECOMMENDED INSTALLATION DETAILS AND INSTALLATION INSTRUCTIONS.*

### 3.2 Installation

- A. General: Install curtain wall systems plumb, level, and true to line, without warp or rack of frames with manufacturer's prescribed tolerances and installation instructions. Provide support and anchor in place.
  - 1. Dissimilar Materials: Provide separation of aluminum materials from sources of corrosion or electrolytic action contact points.
  - 2. Glazing: Glass shall be outside glazed and held in place with extruded aluminum pressure plates anchored to the mullion using stainless steel fasteners spaced no greater than 9" (228.6) on center.
  - 3. Water Drainage: Each light of glass shall be compartmentalized using joint plugs and silicone sealant to divert water to the horizontal weep locations. Weep holes shall be located in the horizontal pressure plates and covers to divert water to the exterior of the building.
- B. Related Products Installation Requirements:
  - 1. Sealants (Perimeter): Refer to Joint Treatment (Sealants) Section.
  - 2. Glass: Refer to Glass and Glazing Section.
    - a. Reference: ANSI Z97.1, CPSC 16 CFR 1201 and GANA Glazing Manual

**3.3 Field Quality Control**

- A. Field Tests: Architect shall select curtain wall units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer's representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected as part of the contract amount.
  - 1. Testing: Testing shall be performed per AAMA 503 by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements.
    - a. Air Infiltration Tests: Conduct tests in accordance with ASTM E 783. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft<sup>2</sup>, which ever is greater.
    - b. Water Infiltration Tests: Conduct tests in accordance with ASTM E 1105. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 8 psf (383 Pa).
- B. Manufacturer's Field Services: Upon Owner's written request, provide periodic site visit by manufacturer's field service representative.

**3.4 Adjusting, Cleaning and Protection**

- A. Protection: Protect installed product's finish surfaces from damage during construction. Protect aluminum curtain wall system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.
- B. Cleaning: Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.
- C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

**DISCLAIMER STATEMENT**

This guide specification is intended to be used by a qualified construction specifier. The guide specification is not intended to be verbatim as a project specification without appropriate modifications for the specific use intended. The guide specification must be used and coordinated with the procedures of each design firm, and the particular requirements of a specific construction project.

**END OF SECTION 084413**